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1 Attorney Docket No. 78179

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3 AN ASSEMBLY AND METHOD FOR POSITIONING A MEASUREMENT PROBE  
4 PROXIMATE A TEST BODY DISPOSED FOR A FLUID TUNNEL TEST  
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6 STATEMENT OF GOVERNMENT INTEREST

7 The invention described herein may be manufactured and used  
8 by or for the Government of the United States of America for  
9 governmental purposes without the payment of royalties thereon or  
10 therefor.  
11

12 BACKGROUND OF THE INVENTION

13 (1) Field of the Invention

14 The invention relates to an assembly and method for holding  
15 and positioning a measurement instrument, and is directed more  
16 particularly to an assembly and method for holding and  
17 positioning a measurement probe close to a test body disposed for  
18 a fluid tunnel test, such as a wind tunnel test, or the like.

19 (2) Description of the Prior Art

20 It is known to determine hydrodynamic performance of a  
21 marine body, such as a vehicle hull, a torpedo, a mine,  
22 submersibles, and the like, by making a series of anemometry and  
23 pressure measurements around the test body in a controlled wind  
24 stream. The results are scaled, through a "Reynolds Number"  
25 correlation, to performance in the water. Inasmuch as an air

1 tunnel generally requires less space and maintenance than a  
2 water-filled test tank, the use of air tunnels for determining  
3 hydrodynamic performance of marine bodies is attractive.

4 The cross-sectional geometry of many underwater vehicles is  
5 circular. Also, the cross section of many windtunnel wind  
6 delivery outlets is circular. Thus, there often is required a  
7 circle of measurement probes around the test body, usually  
8 mounted on arms extending into the test tunnel wind stream to map  
9 out the flow behaviors around the portions of the body under  
10 study. It is further required to produce such "maps" along the  
11 axial length of the test body portion under study.

12 Inasmuch as each measurement probe interferes with the air  
13 flow near the test body, the larger the number of probes used to  
14 acquire a complete picture, the more interference with normal  
15 flow is experienced. Thus, in an effort to obtain a more  
16 complete picture, one may, by overuse of probes, actually  
17 decrease the accuracy of the picture.

18 There is, therefore, a need for a system and method for  
19 mounting a modest number of probes which are readily and easily  
20 movable along the axis of the test body and radially and  
21 circumferentially of the test body, such that the modest number  
22 of probes provide the information heretofore obtained from a  
23 large number of probes, but without significant interference with  
24 fluid flow around the test body.

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1 mounted on a support member extending alongside and removed from  
2 the test body, such that the strut extends radially inwardly  
3 toward an axis of the test body. The strut can then be slid  
4 along the support member to a location abreast of a selected  
5 point on the test body axis. The probe can be moved axially of  
6 the strut and radially of the test body axis to place the probe a  
7 selected distance radially from the test body. The strut can  
8 also be moved circumferentially about the test body axis to place  
9 the probe at a selected location circumferentially of the test  
10 body.

11 The above and other features of the invention, including  
12 various novel details of construction and combinations of parts  
13 and method steps, will now be more particularly described with  
14 reference to the accompanying drawings and pointed out in the  
15 claims. It will be understood that the particular device and  
16 method embodying the invention are shown by way of illustration  
17 only and not as limitations of the invention. The principles and  
18 features of this invention may be employed in various and  
19 numerous embodiments without departing from the scope of the  
20 invention.

#### 21 22 BRIEF DESCRIPTION OF THE DRAWINGS

23 Reference is made to the accompanying drawings in which is  
24 shown an illustrative embodiment of the invention, from which its  
25 novel features and advantages will be apparent.

1 In the drawings:

2 FIG. 1 is a side elevational and diagrammatic view of an  
3 assembly for positioning a measurement probe, which assembly is  
4 illustrative of an embodiment of the invention;

5 FIG. 2 is a perspective view of the assembly of FIG. 1;

6 FIG. 3 is an aft end view of the assembly of FIG. 1;

7 FIG. 4 is an enlarged elevational view of a ball caster of  
8 the type shown in FIG. 3;

9 FIG. 5 is an enlarged side elevational view of an aft ring  
10 support portion of the assembly of FIG. 1; and

11 FIG. 6 is an enlarged aft end view of probe actuator, probe  
12 mount, probe supporting strut, and probe portions of the assembly  
13 of FIG. 1.

14  
15 DESCRIPTION OF THE PREFERRED EMBODIMENT

16 Referring to FIG. 1, it will be seen that an illustrative  
17 embodiment of the assembly includes a forward frame portion,  
18 shown in the form of a forward ring assembly 10 for mounting on  
19 the outlet end 12 of a fluid tunnel, such as a wind tunnel 14.  
20 An aft ring 16 is in alignment with forward ring assembly 10, and  
21 is connected to forward ring assembly 10 by axial support members  
22 18, disposed such that at least two of the support numbers 18  
23 (18a, 18b) are in a side-by-side disposition (FIG. 2).

24 The forward ring assembly 10 includes an inner bearing race  
25 20, which is mounted on wind tunnel outlet end 12, and an outer

1 bearing race 22 having mounted therein a multiplicity of ball  
2 casters 24 (FIG. 3) which ride in inner bearing race 20.  
3 Referring to FIG. 4, it will be seen that the ball casters 24  
4 each include a roller 27 and a roller mount 28. The roller  
5 mounts 28 are fixed on the outer bearing race 22 and the rollers  
6 27 are disposed for rocking movement in the inner bearing race  
7 20. The aft ring 16 is mounted in an aft ring roller support 26  
8 which maintains rigidity of the frame but permits rotational  
9 movement of aft ring 16. Referring to FIG. 5, it will be seen  
10 that the roller support 26 includes a roller 29 on which rests  
11 the aft ring 16.

12 A probe mount portion 30 of the assembly includes a base  
13 member 32 slidably mounted on the side-by-side axial support  
14 members 18a, 18b (FIG. 6) for movement axially of the assembly.  
15 A probe-supporting strut 34 is mounted on base member 32 and  
16 extends radially inwardly of the assembly. The strut 34 houses a  
17 probe 40 driven by a precision accuracy actuator 38 which is  
18 fixed to strut 34 and is operable to move the probe 40 axially in  
19 strut 34.

20 As an alternative, probe 40 can be fixed in strut 34, and  
21 actuator 38 can be fixed to member 32 to move strut 34 toward and  
22 away from test body T. This embodiment has the advantage of  
23 keeping probe 40 a preset distance from potential interference

caused by strut 34. Movement of the probe 40 as in the prior embodiment is preferred because of probe 40 and actuator 38 standardization.

Preferably, the assembly includes a second probe mount portion 30' of the same structure as described immediately above and disposed 180° from the above-described probe mount portion 30.

In operation, a test body T, such as a torpedo, is placed in a fluid tunnel 14, such as a wind tunnel, as shown in FIGS. 1-3, with a portion of test body T undergoing examination protruding from outlet end 12 of wind tunnel 14. As illustrated in FIGS. 1-3, test body T is the after end of a torpedo (without propeller) positioned for test.

The forward ring assembly 10 is secured to the outlet end 12 of the wind tunnel 14. The aft ring 16 is set in aft ring roller support 26. The probe mount portion 30, including the base member 32, strut 34, actuator 38, and probe 40 are mounted on side-by-side axial support members 18a, 18b. It will be apparent that a base member 32 can be provided for attachment to a single axial support member 18 without affecting the operation of the assembly. It has been found convenient to use two axial support members 18 for mounting of base member 32, but such is not necessary.



1       The probe mount portion 30 of the assembly is slid along  
2 axial support members 18a, 18b until the desired point along the  
3 axis of test body T is reached, at which point bolts 42 on base  
4 member 32 are tightened to lock probe 40 in a desired location  
5 along the axis of the test body.

6       The precision accuracy actuator 38, preferably motor-driven,  
7 is actuated to move probe 40 axially in strut 34, to a point at a  
8 desired radial distance from the test body portion T. Tests are  
9 then run and measurements taken at the point at which the desired  
10 axial and radial positions coincide. If there is a second probe  
11 40', measurements at two locations are taken simultaneously, if  
12 desired.

13       To obtain further measurements at the same axial positions,  
14 and same radial distance from the test body B, but at different  
15 circumferential locations, rings 16, 22 are rotated a desired  
16 number of degrees and further tests are undertaken.

17       In this manner, a circle of test points are subjected to  
18 test at a given axial point and a given radial distance. The  
19 axial location of the probe may be changed by further sliding  
20 movement of the base member 32. The radial distance of the probe  
21 40 from the test body T may be changed by operation of the  
22 actuator 38.

23       There is thus provided an assembly and method by which a  
24 multitude of test points may be subjected to tests by a minimal  
25 number of probes with minimal supporting structures, and

1 therefore minimal interference with air flow around the test  
2 body.

3 It is to be understood that the present invention is by no  
4 means limited to the particular construction and method steps  
5 herein disclosed and/or illustrated in the drawings,

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2  
3 AN ASSEMBLY FOR POSITIONING A MEASUREMENT PROBE  
4 PROXIMATE A TEST BODY DISPOSED FOR A FLUID TUNNEL TEST  
5

6 ABSTRACT OF THE DISCLOSURE

7 An assembly for positioning a measurement probe proximate a  
8 test body disposed for a fluid tunnel test includes a frame  
9 having a forward frame portion for attachment to a fluid flow  
10 tunnel fluid outlet, an aft frame portion aligned with the  
11 forward frame portion, and axial support members interconnecting  
12 the forward and aft frame portions. The assembly further  
13 includes a probe mount portion having a base slidably mounted on  
14 one or more of the axial support members, a probe supporting  
15 strut mounted on the base, and a probe mounted in the strut and  
16 movable in directions radially of the frame, and a probe moving  
17 member for moving the probe radially inwardly and outwardly of  
18 the frame portions.

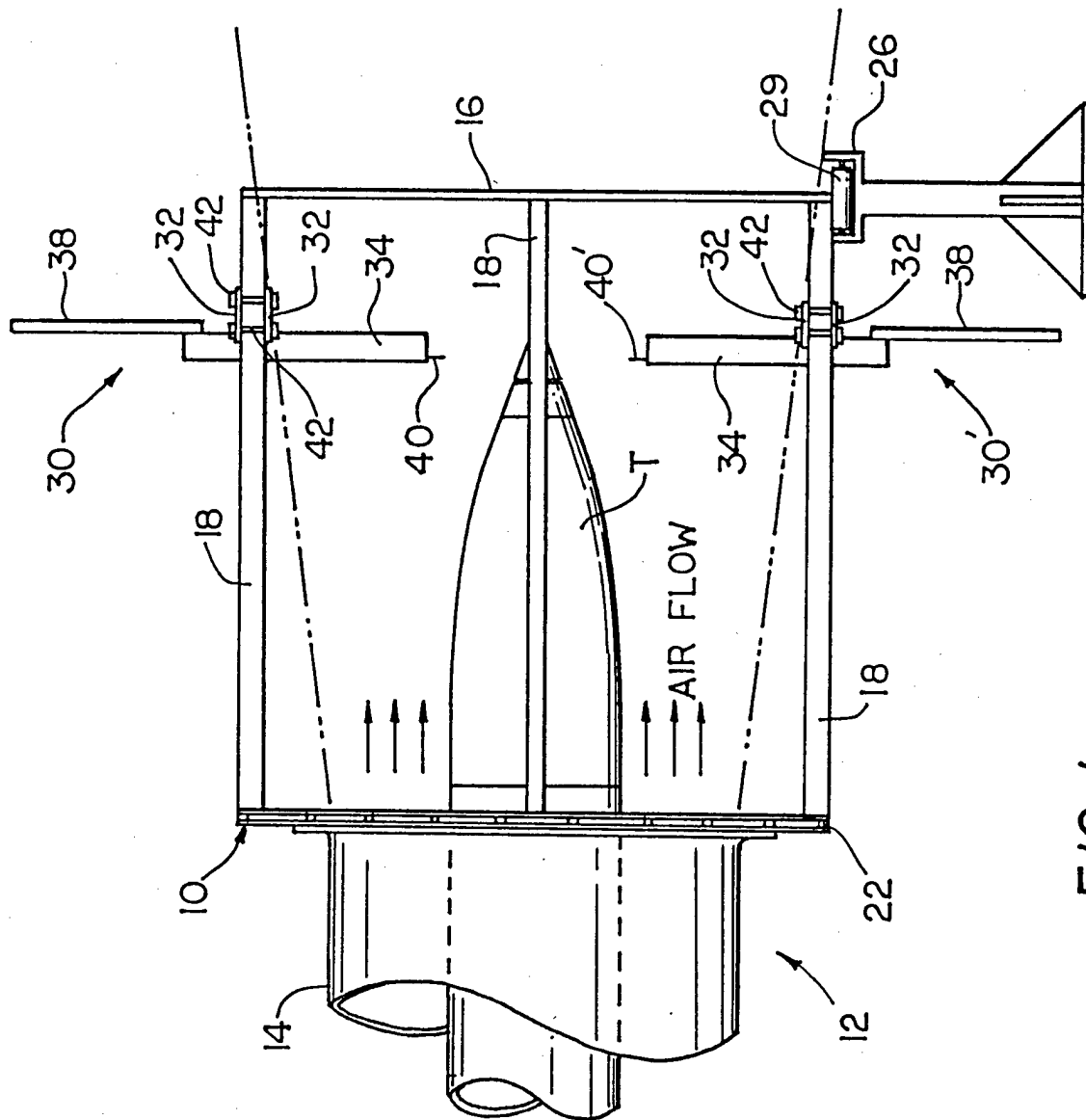


FIG. 1

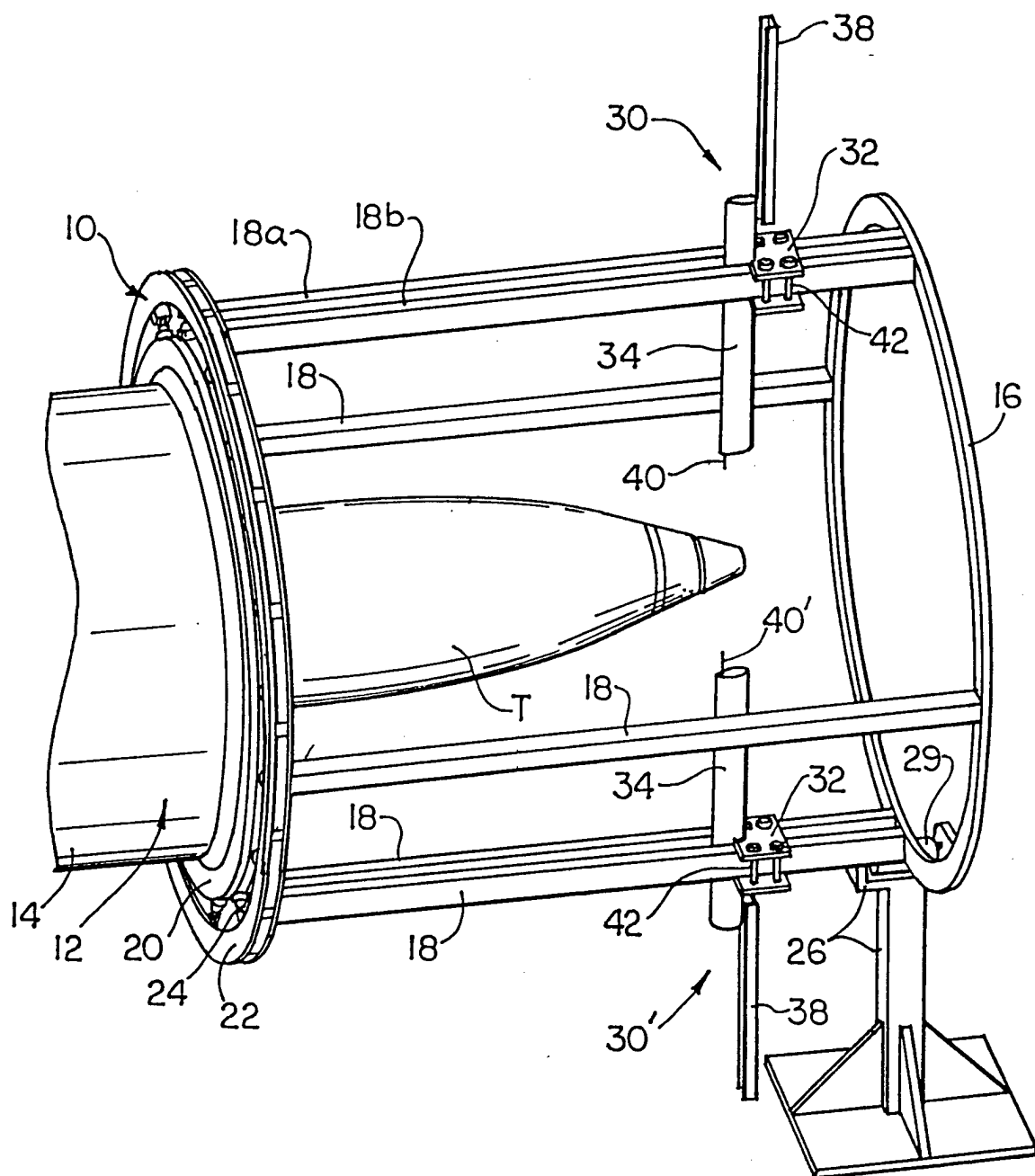


FIG. 2



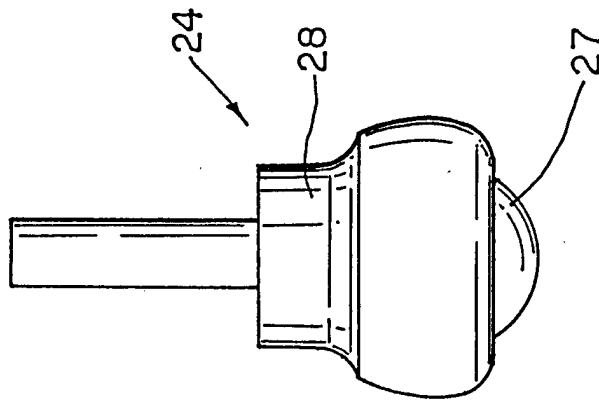


FIG. 4

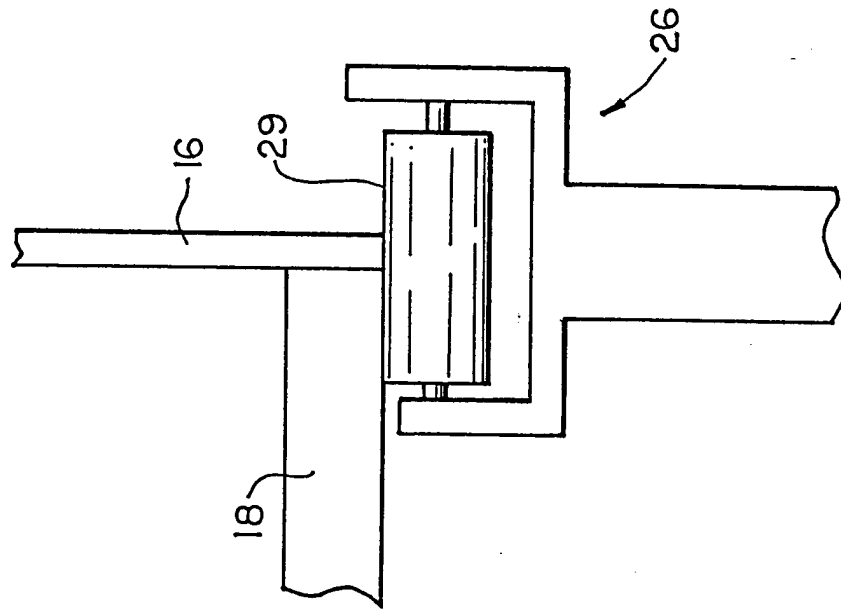


FIG. 5

FIG. 6

